Symmetry

Reporting Category Reasoning, Lines, and Transformations

Topic Exploring symmetry

Primary SOL G.3c The student will use pictorial representations, including computer software, constructions, and coordinate methods, to solve problems involving symmetry and transformation. This will include investigating symmetry and determining whether a figure is symmetric with respect to a line or a point.

Related SOL G.3a, G.3d, G.6, G.14

Materials
- Activity Sheet (attached)

Vocabulary

regular, rotate, rotation (earlier grades)

symmetric, line symmetry, point symmetry (G.3c)

Student/Teacher Actions (what students and teachers should be doing to facilitate learning)

1. Introduce order of rotational symmetry and degrees of rotational symmetry, using examples. (They are defined at the top of the activity sheet.)

2. Distribute copies of the Activity Sheets, and have students work in pairs to complete it. Each student should record his/her own findings. Have students discuss findings with their partners. Discuss findings as a whole group.

Assessment
- **Questions**
    - If a figure has 60° rotational symmetry, what other rotational symmetries must it have? Explain.
    - Does a regular octagon have 90° rotational symmetry? Explain.
    - A hexagon has point symmetry. What can you say about the opposite sides? Explain.
    - Does a parallelogram have to have any symmetry? Explain.
- **Journal/Writing Prompts**
    - How can you determine whether a figure has rotational symmetry and what the order is, if it does?
    - Describe a real-world example of an object that demonstrates rotational symmetry. Include the order in your description.
    - Have students complete a journal entry summarizing the activity.
- **Other**
    - Have students find words or phrases that have point or line symmetry (at least when written in all capital letters.)
    - Have students draw a figure that has rotational symmetry but not line symmetry.

- o Have students create or find designs that illustrate various symmetries.
- o Give students a figure such as **L** or **?**, and have them use the figure to create diagrams with 90° rotational symmetry and two lines of symmetry.

Extensions and Connections (for all students)

- Show students graphs of equations, such as $y = x^2$, $y = (x − 1)^2$, $y = x^2 + 1$, $y = x^3$, $x^2 + y^2 = 1$, $y = \sin x$, and $y = \cos x$, and ask which graphs are symmetric with respect to the y-axis and which have point symmetry with respect to the x-axis.
- Show students a picture that illustrates reflectional symmetry, and ask what it has to do with transformations.
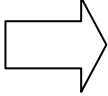
Strategies for Differentiation

- Depending on the level of students, it may be necessary to introduce the vocabulary before students start the activity.
- Depending on the level of students, it may be necessary to work through a couple of examples with the class before they complete the activity. Use of an interactive whiteboard is encouraged.
- Use mirrors or image reflectors to explore line symmetry.
- Use patty paper to explore rotational symmetry. Use a dot to mark the rotation point.

Activity Sheet: Symmetry

Name _____ **Date** _____

- A figure has **line symmetry** if there is a line that divides the figure into mirror images.
- A figure has **rotational symmetry** if it looks the same when rotated some angle measure less than 360 degrees. Its **order of rotational symmetry** is the number of positions a figure can be rotated, without changing the way it looks. It has n° rotational symmetry (for example 90° rotational symmetry) if it looks the same when rotated n°.
- A figure has **point symmetry** if it looks the same upside-down, or rotated 180 degrees. Such a figure also has rotational symmetry of order 2.

Identify the apparent number of lines of symmetry and order of rotational symmetry for each figure. Assume polygons that appear to be regular are.

	Number of Lines of Symmetry	Order of Rotational Symmetry	Degrees of Rotational Symmetry	Does this figure have point symmetry?
◇	4	4	90, 180, 270, 360	yes
▭				
⯃				
⬡				
⇨			360	
△				
☆				
♻				
M				
A				
T				
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